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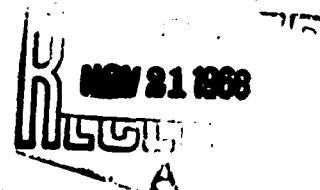
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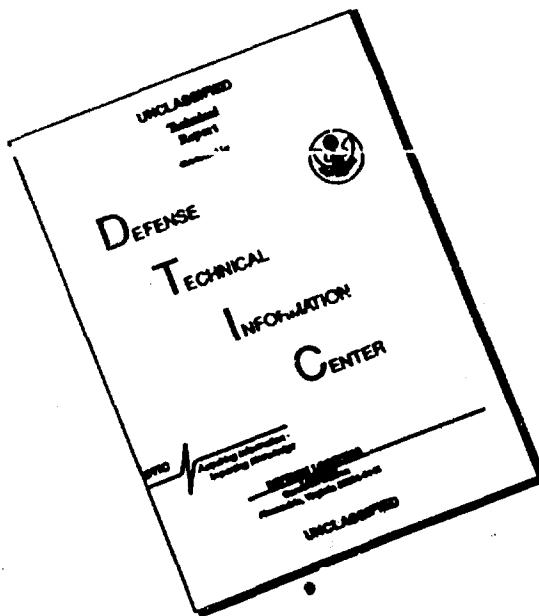


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DESCRIPTION OF WHEAT SUSCEPTIBILITY TO LOOSE SMUT
(Methodological Aids for Breeders)

Kharakteristika porazhayemosti pshenits
pyl'noy golovney (Metodicheskoye posobiye
seleksioneram) (English version above),
All-Union "Order of Lenin" Academy
of Agricultural Sciences imeni
V.I. Lenin,
Leningrad, 1965, pages 1-32

V.I. Krivchenko
and
M.M. Yakubtsiner

Introduction

At the present time by far not all of the experimental breeding institutions evaluate original collection specimens of winter and spring wheat for their resistance to loose smut [Ustilago]. For this reason, quite often vulnerable strains are used in crosses. This leads to subsequent rejection of a large amount of seeds and strains of hybrids because of their susceptibility to this disease.

Breeding wheat for resistance to loose smut can be improved considerably if in selecting the initial parental pairs for crosses the resistant strains are used. For this reason, of great importance is rating of the wheat specimens of different strains and species from the world collection of VIR [All-Union Scientific Research Institute of Plant Growing] which are used extensively by the experimental breeding network of our country in creating new productive strains.

For a number of years work was pursued at the Laboratory of Immunity of the All-Union Institute of Plant Protection dealing with evaluation of initial specimens, strains and species of wheat with respect to their resistance to loose smut.

These studies were conducted with due consideration of the distribution in the different zones of physiological forms of the pathogen, differing in their ability to infect the different strains of wheat.

Our studies established that in our country the following 14 physiological forms of loose smut are important, and they must be taken into consideration in practical breeding work.

- No 1 -- isolated from strain Osetinskaya 3, North Ossetian Autonomous SSR, Kabardino-Balkarskaya Autonomous SSR.
- No 3 -- isolated from strain Kishinevskaya 8, Moldavian SSR.
- No 4 -- isolated from local soft wheat, Armenian SSR
- No 5 -- isolated from strain Novourkainka 84, Krasnodarskiy Kray
- No 6 -- isolated from strain Gordeiform 48-2, Khar'kovskaya Oblast
- No 7 -- isolated from strain Cesium III, Omskaya Oblast
- No 9 -- isolated from strain Narodnaya, Rostovskaya Oblast
- No 10 -- isolated from strain Narodnaya, Kurganskaya Oblast
- No 13 -- isolated from strain Milturum 553, Krasnoyarskiy Kray
- No 14 -- isolated from strain Albidum 43, Volgogradskaya Oblast
- No 15 -- isolated from strain Albidum 43, Voronezhskaya Oblast
- No 18 -- isolated from strain Grecum 433, Uzbek SSR.
- No 22 -- isolated from strain Lutescence 62, Orenburgskaya Oblast.
- No 23 -- isolated from strain Gordeiform 10, Omskaya Oblast.

All of our work on resistance rating was conducted with the above forms of smut.

In these studies we used wheat specimens of different origin, species composition and differing in developmental biology. They included specimens of value in hybridization.

In addition to the widely distributed species, *Triticum aestivum*, *Triticum durum*, we made a thorough evaluation of smut resistance of specimens of other rare species.

The selection of species and strains of wheat for evaluation was made by the supervisor of the Wheat Section, VIR: M.M. Yakubtsiner.

Loose smut resistance was demonstrated only under conditions of artificial infection of the plants by the vacuum method.

Wheat susceptibility was rated on the following scale:

- 0 -- highly resistant strains
- I -- essentially resistant (up to 5% susceptibility)
- II -- mildly susceptible (up to 25%)
- III -- moderately susceptible (up to 50%)
- IV -- strongly susceptible (over 50%)

The strains and specimens of wheat referable to susceptibility groups 0 and I were rated for resistance to the different forms of loose smut for at least three consecutive years. Those which we classified in these two groups are resistant to the set of smut forms.

Over 500 specimens are submitted in the list. Of these 46 strains and specimens of *Triticum aestivum*, *Triticum durum* and 39 other species of wheat are highly resistant. Only 85 were found to be essentially [practically] resistant, and 80 of them consisted of *Triticum aestivum* and *Triticum durum* strains.

The work on isolation of physiological forms of loose smut and description of wheat resistance to them was performed by V.I. Krivchenko under the supervision of Professor T.I. Fedotova, head of the Laboratory of Immunity, All-Union Institute of Plant Protection. M.M. Yakubtsiner (VIR), Doctor of Agricultural Sciences, classified the initial material according to ecological groups.

[source page 6]

SUSCEPTIBILITY OF WHEAT SPECIMENS TO LOOSE SMUT (Physiological forms)

[Column headings]:

- 1) VIR [All-Union Scientific Research Institute of Plant Growing] catalogue number
- 2) Variety
- 3) Strain
- 4) Origin
- 5) Susceptibility to loose smut [Ustilago]

STRAINS OF WHEAT RELEASED TO RAYONS IN THE USSR

Soft Spring Wheat

[Column 3]	[Column 4]
Al'bidum 43	Scientific Research Institute of the South-East
Akmolinka I	All-Union Scientific Research Institute of Grain Crops
Dublyanka 4	L'vov Agriculture Institute
Bashkirskaya 4 (Lutescence 4)	Bashkir Scientific Research Institute of Agriculture and Kinel'skaya Breeding Station
Bezenchukskaya 98	Kuybyshev Oblast State Agricultural Experimental Station
Garsas	Lithuanian Scientific Research Institute of Agriculture
Grazhuchay	" "
Dal'nevostochnaya (Far Eastern)	Primorskaya Agricultural Experimental Station
Zavol'skaya	Kinel'skaya Breeding Station
Irody 1006	Tadzhik Scientific Research Institute of Agriculture
Iskra (Milturum 1447)	Chelyabinsk State Agricultural Experimental Station

[source page 6, continued]

[column 3]

Kazakhstanskaya 126

Lutescens 62

Lutescens 758

[source p7] Lutescens 1729

Milturum 321

Milturum 553

Moskovka

Odesskaya 13

Onokhoyskaya 4

PPG 56

Sarrubra

Saratovskaya 210

Saratovskaya 29

Skala

Smena

Strela

Tulun 14

Cassium [cesium] III

[column 4]

Kazakh Scientific Research Institute
of Agriculture

Scientific Research Institute of Agri-
culture of the South-East

" " " "

Krasnoyarsk Scientific Research Insti-
tute of Agriculture

Siberian "Red Banner of Labor" Scienti-
fic Research Institute of Agriculture

" " " "

Scientific Research Institute of
Agriculture of the Central Rayons
of the Nonchernozem Zone

All-Union Institute of Breeding and
Genetics

Buryatin Republic State Agricultural
Experimental Station

~~former~~
[expansion unknown] Kazakh Experi-
mental Center, Main Botanical Garden,
AN SSSR [USSR Academy of Sciences]

Scientific Research Institute of Agri-
culture of the South-East

" " " "

" " " "

Tulun State Breeding Station

SibNIISKhOZ [Siberian "Order of Red
Banner of Labor" Scientific Research
Institute of Agriculture]

Krasnoufinskaya Breeding Station

Tulun State Breeding Station

SibNIISKhOZ

[source page 7, continued]

[column 3]	[column 4]
Caesium 94	SibNIISKhOZ
Caesium 31	Altay Scientific Research Institute of Agriculture
Shortandinka	All-Union Scientific Research Insti- tute of Grain Crops

[source page 8]:

Spring Hard Wheat

Akmolinka 5	All-Union Scientific Research Insti- tute of Grain Crops
Gordeiforme 10	SibNIIKhOZ
Raketa	Krasnoyarsk Scientific Research Insti- tute of Agriculture
Gordeiforme 432	Scientific Research Institute of Agriculture of the South-East
Gordeiforme 5695	" " " " "
Kubanka 3	Krasnodar Scientific Research Insti- tute of Agriculture
Kustanayskaya 14	Kustanay State Agricultural Experimental Station
Malyanopus 26	Krasnokutsk Breeding Station
Malyanopus 69	" " "
Marodnaya	Ukrainian Scientific Research Insti- tute of Plants, Breeding and Genetics

Winter Soft Wheat

Alty-Agach	Armenian SSR
Arasbugdasy	Azerbaijani Scientific Research Insti- tute of Agriculture
Besostsaya 1(4/1) [ownless]	Krasnodar Scientific Research Institute of Agriculture

[source p 8, continued]:

Column 3

Belotserkovskaya 198

Bel'tskaya 32

Veselopodolyanskaya 499

[source p 9]:

Bol-Bugda (Ferruginosum 50)

Gostianum 237

Grekum 433

Gyul'geri

Doliyepuri 35/4

Krigizakaya 3

Krynska mestnaya

Kubanskaya 131

Lutescens 266

Mironovskaya 264

Motsinave

Muras

Odesskaya 3

Odesskaya 16

Column 4

Belotserkovsk ^{exp} experimental Breeding Station

Moldavian Scientific Research Institute of Breeding, Seed Growing and Agricultural Technology

Veselopodolyansk Breeding Station

Institute of Genetics and Breeding, Azerbaijan SSR

Scientific Research Institute of Agriculture of the South-East

Krasnovodopadskaya State Breeding Station

Dagestan Autonomous SSR

Georgian Experimental Breeding Station

Kirgiz Scientific Research Institute of Agriculture

Krymskaya Oblast

Krasnodar Scientific Research Institute of Agriculture

Ukrainian Scientific Research Institute of Plant Growing, Breeding and Genetics

Mironov Experimental Breeding Station

Georgian Experimental Breeding Station

Lithuanian Scientific Research Institute of Agriculture

All-Union Scientific Research Institute of Breeding, Genetics.

" " " "

[source page 9, continued]:

Column 3	Column 4
Stepnaya 135	Scientific Research Institute of Agriculture of the Central Chernozem Belt
Ukrainka	Mironovskiy Kirov Experimental Breeding Station
Ferrugineum 1239	Ukrainian Scientific Research Institute of Plant Growing, Breeding and Genetics

[source page 10]:

Khar'kovskaya 4 " " " "

Hard Fall Sowing

Aramdany	Azerbaydzhan Scientific Research Institute of Agriculture
Dahafari	Azerbaydzhan Agricultural Institute
Michurinka	All-Union Breeding and Genetics Institute

Soviet Specimens of Soft and Hard Wheat

Ecological Groups of Soft Spring Wheat

Volga Steppe

Bashkirka Kugushevskaya	Bashkir Autonomous SSR
Erythrosperum 341	Scientific Research Institute of Agriculture of the South-East

Eastern Forest-Steppe

Omskaya 2078	SibNIISKhOZ
Golubka	Kustanay State Strain Plot
Natural Hybrid	
Ferrugineum 9	
Ural'skaya 16	
Lutescens 23	Krasnoufinsk Breeding Station

[Source page 11]:

Column 3

Column 4

Southern Forest-Steppe

Milturum 162	Ukrainian Scientific Research Institute of Plant Growing, Breeding and Genetics
Lutescens 491	Ivanov Experimental Station (Ukrainian SSR)
Lutescens 1326/32	Orlov Agricultural Experimental Station
Ferrugineum 13	Krasnodar Scientific Research Institute of Agriculture

Circumpolar

Sibirka 1818	Tulun State Breeding Station
Udarnitsa	" " " "

North-Russian Forest

Kauka	Vygava [redacted] Breeding Station
Tayka	Lithuanian SSR

Sakhalin

Kaba 135	Sakhalin Base of USSR Academy of Sciences
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Central Asian Bogar [dry, unirrigated] Region

Pseudoturcicum 2115	Krasnovodop. State Breeding Station
Alborubrum 22308	" " " "
Vatan	Scientific Research Institute of Bogar Agriculture, Uzbek SSR
Abi-Yaleguri	Uzbek SSR

Central Asian Lowlands (Irrigated)

Kalek M-I	Turkmen State Breeding Station
-----------	--------------------------------

[source page 12]

Column 2	Column 3	Column 4
<u>Various Hybrids</u>		
PPG 1115		Main Botanical Garden, USSR Academy of Sciences
Population Sharovidnaya		TSKhA (Timiryazev Agricultural Academy)
<u>Ecological Groups of Hard Spring Wheat</u>		
<u>Eastern Forest-Steppe</u>		
-----		Kirgiz SSR
<u>Mediterranean Falcate</u>		
Zogal-Bugda		Azerbaydzhani SSR
<u>Ecological Group of Soft Winter Wheat</u>		
<u>Southern Steppe (North Caucasian)</u>		
Zernogradka		Don Zonal Agricultural Institute
Voroshilovskaya		Stavropol' Experimental Breeding Station
Hybrid 481	"	" " " "
Stavropol'skaya 328	"	" " " "
Stavropol'skaya 4	"	" " " "
<u>Southern Steppe (Maritime ["Primorskaya"])</u>		
Mestnaya [local]		Krymskaya Oblast
-----		" "
Zemka		All-Union Breeding and Genetics Institute
<u>[Source page 13]</u>		
Stepnyachka	"	" " " "
Odesskaya 12	"	" " " "
Novokrymska		Krymskaya Oblast Agricultural Experimental Station
Novokrymska 102	"	" " " "

[source page 13]

Column 2	Column 3	Column 4
Lutescens 17		Cherkas State Agricultural Experimental Station
Kishinevskaya 10		Kishinev Agricultural Institute
Kishinevskaya 8	"	"
population	-----	Moldavian SSR
		<u>Volga Steppe</u>
Saratovskaya 28		Scientific Research Institute of Agriculture of the South-East
-----		Volgogradskaya Oblast

North Caucasism Forest-Steppe

Skorospelka L-1		Krasnodar Scientific Research Institute of Agriculture
Skorospelka 2	"	"
Skorospelka 3	"	"
Bezostaya 4	"	"
Ferrugineum 013	"	"
Kubanskaya 24	"	"
Kubanskaya 133	"	"
Kubanskaya 122	"	"

[source p 14]

Dannyaya 28	"	"	"
Novoukrainka 84	"	"	"
N-43	"	"	"
Improved Ossetinskaya		North Ossetian Agricultural Experimental Station	
Jubilee Ossetin	"	"	
Ossetinskaya 5	"	"	

[source page 14 continued]

Column 3	Column 4
Erythrospermum 1562	Ossetian North Ossetian Agricultural Experimental Station
Erythrospermum 1585	" " " "
Erythrospermum 1580	" " " "
Erythrospermum 1563	" " " "
Osetinskaya 3	" " " "
Skorospelka 937	" " " "
Germaniya 199	" " " "

Ukrainian Forest-Steppe

Albidum 676	Ukrainian Scientific Research Insti- tute of Plant Growing, Breeding and Genetics
-------------	---

[source page 15]

Shampanka	Ukrainian SSR, Khersonskaya Oblast
Pimenka	All-Union Scientific Research Insti- tute of Sugar Beets
Lutescens 17	Cherkas State Agricultural Experi- mental Station
Erythrospermum 15	" " " "
Ivanovskaya (20/430)	Ivanov Experimental Breeding Station
Dyurabl'	" " " "

Forest Steppe of Mountainous Region of Ukraine

Zarya mestnaya	Ivano-Frankovskaya Oblast
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North Russian Forest

Erythrospermum 529	Palen Breeding Station
Moskovskaya 3251	TSKhA
Moskovskaya 2411	" "

[source page 15, continued]

Column 3

Column 4

Eastern Forest-Steppe

Yelovka

Altayskiy Kray

Kazachinskaya

Krasnoyarskiy Kray

Forest-Steppe of Caucasian Mountain Region

Dzali-Sura 35/3

Georgian Experimental Breeding Station

Caesium 3/10

" " " "

[source page 16]

Kyrmyzy-Bugda 9704/2

Azerbaiydzhan Scientific Research
Institute of Agriculture

Steppe of Caucasian Mountain Region

Zarda

Armenian SSR

" "

Yenilik

Azerbaiydzhan SSR

Subtropical of Caucasian Mountain Region

Rachula

Georgia SSR

Gomborka

" "

Transcaucasian Lowland-Foothills

Nagorno-Karabakhkaya Autonomous Oblast

Central Asian Lowland Irrigated

Belen'kaya

Kazakh SSR, Dzhambulskaya Oblast

Almaatinakaya

Kazakh Scientific Research Institute

Kollyanbugday

Uzbek SSR

FOREIGN SPECIMENS

Ecological Groups of Soft Spring Wheat

[source page 16, continued]

Column 3

Column 4

Pakistan

—	Pakistan
—	"
Soor ghamm	"
—	"
—	"

[source page 17]:

Chinese (in the broad sense)

China
"
"
Tsun-iy-hum-hus-mai
"
"
"

Central Asian (Kashgar)

China, Kashgar

" "

" "

[column 2]

population

Central Asian

Mongolia

Iran

Anatolian

Turkey

Near Eastern

Israel

Yemen

[source page 17, continued]

column 3

column 4

Mediterranean

Morocco

Eritrea

Algeria

Greece, Rhodes

[source page 18]

Balkans

Yugoslavia

Bulgaria

"

Danube Region

Austria

"

Strain 691

Yugoslavia

"

Czechoslovakia

Andes

Brazil

Uruguay

Mexico

Hybrid Groups of Soft Spring Wheat

Kenya

Kenya

Appenines

Italy

[source page 18 continued]

column 3

column 4

Scandinavian

Diment

Sweden

Fil'giya

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[source page 19]

Central European

German Democratic Republic

" " "
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France

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Holland

North American

Canada

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[source page 19, continued]

column 3

column 4

USA

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[source page 20]:
DS II

Argentinian

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[source page 20, continued]

column 3

column 4

Kleyn 66

Argentina

Complex hybrid

[source page 21]

Kleyn 33

"

"

Australian

Australia

"

"

"

"

QuAR (South Africa) Republic

Tunisia

Ecological Groups of Hard Spring Wheat

Near Eastern

Jordan

Malta

Cypriote

Cyprus

"

Egyptian

United Arab Republic

" " "

East Mediterranean

Tunisia

"

"

"

"

[source page 22]

column 3

column 4

Algeria

"

Morocco

"

Republic of South Africa

" " "

West Mediterranean

Italy

"

Balkans

Turkey

Greece

Pyrenees

Spain

"

"

Portugal

"

Hindustan

India

North American

USA

"

"

"

[source page 23]:

Various Forms

USA

Czechoslovakia

[source page 24, continued]

column 3

column 4

	China
	"
An-sung-to-yang-Mai	"
Ta-Ya-Tz'u-tsui	"
Hung-huo-Sang-t'ou	"
Chinese I	"
	"

[source page 25]

Adriatic Large Grain

China

Balkans

I-I	Yugoslavia
	"
Strain 781	"
	"
	"
	"
Maks Cryzh VI	"
Okkerman	Bulgaria
No 2315	"
Ferruginosum 113	"
Dunavka	"
No 11	"
(ER-25)	"
(ER-23)	"
ER-134	"
IZR-408	"

[source page 26]

column 3

Kr"stoska 67

Kulitsa belyaya

column 4

Bulgaria

"

"

Albania

Danube Region (Forest-Steppe)

Czechoslovakia

"

"

"

Godoninskaya

Rumania

"

Tsianeshty

Hungary

"

Ostatka Mikulitska

Poland

Alps

Italy

Hybrid Groups of Winter Soft Wheat

Appenines

Italy

"

"

"

[source page 27]:

West European

England

"

France

"

German Democratic Republic

"

"

"

[source page 27, continued]

column 3.

column 4

North American

USA

"

Argentinian

Argentina

"

Various Forms

USA

"

"

"

"

"

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"

"

"

German Democratic Republic

RPG 26/49

Fall Planting Hard Wheats

Karabashok

Yugoslavia

Hordeiforme No 132

Bulgaria

column 2 Chirpan 13

"

population
of hard and
soft wheat

"

Roumania

Rare Hexaploid Species of Spring Wheat

Dwarf Wheat (*Tr. compactum* Host.)

Tadzhik SSR

Turkmen SSR

USA

Afghanistan

[source page 28, continued]

column 3

column 4

Spherical Grain Wheat (Tr. sphaerococcum Pers.)

India
"
Pakistan
"

[source page 29]:

Spelta (Tr. spelta L.)

Spain
~~USSR~~
Lvov Oblast

Rare Tetraploid Species of Spring Wheat

Turan Wheat (Tr. turanicum Jakubz.)

Dagestan Autonomous SSR

Tadzhik SSR

Gendum dossiya

Iran

Ethiopian Wheat (Tr. aethiopicum Jakubz.)

Ethiopia
"
"
"
"

Persicum or Kakhtalinskaya Wheat
(Tr. carthlicum Nevskii; Syn. - Tr. persicum Vav.)

Dika 9/14

Georgian SSR
"
"

Dagestan Autonomous SSR

~~Ossetian~~
North Ossetian Autonomous SSR

Armenian SSR

[source page 30]

Turgidum Wheat (Tr. turgidum L.)

Turkey
Spain
Portugal
Chile

[source page 30, continued]

column 3

column 4

Polonicum What (Tr. polonicum L.)

Altayskiy Kray

Kazakh SSR

Georgian SSR

Turkey

German Democratic Republic

Spelt (Tr. dicoccum Schrank)

Bashkir Autonomous SSR

Ul'yanovskaya Oblast

Drogobychskaya Oblast

Nakhichevanskaya Autonomous SSR

India

Ethiopia

"

Yemen

Morocco

Yugoslavia

German Federal Republic

[source page 31]:

Rare Diploid Single Grain Forms (Tr. monococcum L.)

Azerbaydzhani SSR

Turkey

Bulgaria

Spain

Genus Haynaceticum Zhuk.

TSKhA

[source page 31, continued]

column 2	column 3	column 4
		<u>Rare Hexaploid Species of Winter Wheat</u>
		<u>Dwarf Wheat (Tr. compactum Host)</u>
		Georgian SSR
		Turkmen SSR
		Afghanistan
'population		"
		Iraq
		China
Ch'ui-wa-shui		"
		"
		"

Wheat imeni Vavilov (Tr. vavilovi Jakubz.)

Armenian SSR
Tr. Macha Dek. et Men.
Georgian SSR

[source page 32]: Tr. Spelta L.

German Federal Republic

Rare Tetraploid Species of Winter Wheat.

Tr. turgidum L.
Azerbaydzhan SSR
" "
Georgian SSR
Migovskaya Lvovskaya Oblast
population Yugoslavia
Poland
German Democratic Republic

(source page 232, continued)

column 3

column 4

Spelt (Tr. dicoccum Schrank)

Italy

Wild Spelt (Tr. dicoccoides Schweinf.)

Israel